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Exploration of a Floquet phase diagram in a driven optical lattice[1]

KEVIN SINGH, KURT FUJIWARA, ZACHARY GEIGER, MIKHAIL LIPATOV, DAVID WELD, Univ of California - Santa Barbara — Ultracold atoms in modulated optical lattices provide an ideal test bed for exploring the response of many-body quantum systems to strong driving. The stabilization or destabilization of new states of matter by variation of drive parameters can be encapsulated in Floquet phase diagrams; these maps of system properties as a function of drive parameters can be viewed as a nonequilibrium generalization of thermodynamic phase diagrams. We report on experimental exploration of a Floquet phase diagram using ultracold bosonic lithium in a strongly-driven optical lattice. As the drive frequency and amplitude are tuned into previously unexplored regions, we observe a sharp transition line between stable and unstable behavior. We explore the effect of Feshbach-tunable interactions and variable tunneling on the properties of this Floquet phase diagram, and compare the results to classical and quantum theories.

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